

# Emergence periods of two beetles, *Oryzaephilus surinamensis* (Cucujidae) and *Tribolium castaneum* (Tenebrionidae), from dum nuts, *Hyphaene thebaica*, in India

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(With two text-figures)

## INTRODUCTION

The dum nut is the seed of the dum palm, *Hyphaene thebaica* Mart., of the Sudan, Africa, and is imported into India for manufacturing buttons and beads. The nut has a pear-shaped, brown-coated body, c. 4-5 cm. in diameter. It has a hard, 7-15 mm. thick white kernel or 'ivory,' the centre of the seed being hollow. It is the 'ivory' which is made into buttons and beads. The nuts are frequently infested by three species of beetles, viz., *Coccotrypes dactyliperda* (Fabricius) (Scolytidae), *Oryzaephilus surinamensis* (Linnaeus) (Cucujidae) and *Tribolium castaneum* (Herbst) (Tenebrionidae). The infection spoils the 'ivory' due to the excavation of galleries and emergence holes, and causes considerable loss to industry.

Infested nuts and pieces were obtained from Coimbatore (southern India), a manufacturing centre, and observed in cages in unconditioned rooms at Dehra Dun during 1951-52 and 1955-56. Here the summer (April to mid-June) is moderately warm, the monsoon rains (mid-June to September) heavy and the winter (November to February) severe, with frequent frost but as a rule no snow. The average monthly room temperature and relative atmospheric humidity during the hot and cold months were as follows :—

Item	May-June	December-January
1. Average minimum temperature	.. 26°-27°C	8°-10°C
2. Average maximum temperature	.. 31°-32°C	12°-15°C
3. Average relative humidity (%) at 9.30 hrs.	.. 56-60%	78-83%
4. Average relative humidity (%) at 16.30 hrs.	42-55%	69-75%

The heaviest infection was by *Coccotrypes* (18,655 beetles emerged from the entire material, *vide infra*), while infection by the other two species was relatively small (emergences: 55 beetles of *Oryzaephilus* and 110 of *Tribolium*).

Five lots (A,B,C,D,E), comprising 55 whole nuts, 142 pieces and 118 buttons, were obtained at various periods during 1951 (Lot A) and 1955 (Lots B-E) and were kept under almost daily observation until all emergence had ceased. The nuts and pieces were then broken and examined for any remaining beetles or larvae. Some relevant details of each lot are given below.

*Lot A.*—4 whole nuts. Caged on 16 October 1951.

*Lot B.*—22 whole nuts and 83 pieces. Were *en route* from 12 February to 17 March, 1955; caged on 18 March 1955.

*Lot C.*—19 whole nuts and 4 pieces. Were *en route* from end June to early July 1955; caged on 8 July 1955.

*Lot D.*—6 whole nuts, 45 pieces and 118 buttons. Were *en route* in early November 1955; caged on 18 November 1955.

*Lot E.*—4 whole nuts and 10 pieces. Were *en route* in December 1955; caged on 28 December 1955.

As no information on emergences of the last two species from dum nuts in India is available, the details observed here are given below. Emergences of *Coccotrypes dactyliperda* will be discussed separately (Roonwal, *in press*).

#### OBSERVATIONS

##### 1. *Oryzaephilus surinamensis* (Linnaeus)

(The Saw-Toothed Grain Beetle)

(Text-fig. 1)

Emergence of beetles from the five above mentioned lots of dum nuts are discussed below. Emergence occurs from tiny, round holes, *c.* 1 mm. or less in diameter, on the surface of the nut.

##### *Lot A*

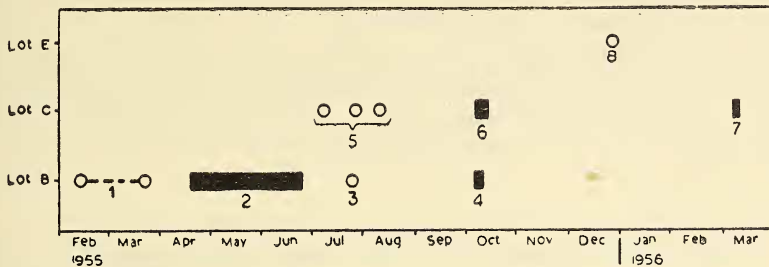
No *Oryzaephilus* emerged, though some 5347 *Coccotrypes* came out.

##### *Lot B*

The monthly distribution of the 44 beetles which emerged was as follows:—February and March, 3 (*en route*) (6·8%); April, 14 (31·8%); May, 20 (45·5%); June, 2 (4·6%); July—September, 0; and October, 5 (11·3%).

Grouping emergences into active and inactive periods (Table 1) is more instructive. After the scanty emergence *en route* (from Coim-

batore : 3 beetles) during the period 12 February to 17 March, there was no emergence until 18 April. For the following 39 days, from 19 April



TEXT-FIG. 1. *Oryzaephilus surinamensis*. Diagram showing emergence periods of beetles from dum nuts, *Hyphaene thebaica*, at Dehra Dun. Main or heavy emergences (Nos. 2, 4, 6 and 7) are shown in thick solid rectangles; and odd emergences (Nos. 3 and 5) in small circles. Emergences at Nos. 1 and 8 occurred *en route*. (See Table 1 for fuller details.)

TABLE 1

EMERGENCES OF BEETLES OF *Oryzaephilus surinamensis* FROM DUM NUTS, *Hyphaene thebaica*, at DEHRA DUN DURING 1955, GROUPED INTO ACTIVE AND INACTIVE PERIODS

Period (1955)	No. of days	Beetles emerged	
		Number	% of total emergence
Lot B (1955)			
(1) 12 Feb.—17 Mar. ( <i>en route</i> ) ..	34	3	6.8
(2) 18 Mar.—18 Apr. ..	32	0	0
(3) 19 Apr.—27 May ..	39	34	77.3]
(4) 28 May—23 June ..	27	0	0
(5) 24 June ..	1	2	4.5
(6) 25 June—5 Oct. ..	103	0	0
(7) 6—13 Oct. ..	8	5	11.4
No further emergence up to 18 May 1956.			
Total ..	244	44	—
Lot C (1955)			
(1) 8—17 July ..	10	0	0
(2) 18 July—24 Aug. ..	38	9	90
(3) 25 Aug.—12 Oct. ..	49	0	0
(4) 13 Oct. ..	1	1	10
No further emergence up to 18 May 1956.			
Total ..	98	10	—

to 27 May, there was active emergence and 34 beetles (77.3%) emerged. Thereafter, there was a gap of nearly 4½ months, from 28 May to 5 October,

during which there was no emergence except for two beetles on 24 June. This lull was then followed by a short 8-day period (6-13 October) of activity during which 5 beetles (11.3%) emerged, after which emergence ceased and no insects were left in the nuts. Thus, leaving aside the odd emergence on 24 June, there were three emergence periods, viz., February to about middle March, third week April to end May and a few days in the first half of October ; of these, the middle period, of about a month and a half in summer, was the most active.

#### *Lot C*

Of the small emergence of 10 beetles, the heaviest (9 beetles) occurred during the 38-day period from 18 July to 24 August, and one on 13 October.

#### *Lot D*

No *Oryzaephilus* emerged though some 89 *Coccotrypes* came out.

#### *Lot E*

Only one *Oryzaephilus* emerged, in late December *en route* ; none emerged later in the cage.

#### *Conclusions*

From the data discussed above it will be seen that under Dehra Dun conditions, with its severe winter (November to February), there are two main periods of emergence, both in the warm months, viz., one in April-May for about 5 weeks (*c.* 19 April to 27 May) and the other in July-August, also for about 5 weeks (*c.* 18 July to 24 August). A third period, of relatively weak emergence, is observable in the first half of October (*c.* 6-13 October). Some emergence *en route* from Coimbatore occurred during 12 February-17 March and in December, and an odd emergence occurred on 24 June.

The beetle is a world-wide pest of grain and other such stored products, and also occurs in bark and twigs in forests in India. Brief accounts of its life-history and control will be found in Beeson (1941), Mookherjee (1964) and Kushwaha and Sharma (1968). According to Beeson the life-cycle in flour in India may be completed in 7 weeks ; and emergences from bark continues throughout the year. Kushwaha and Sharma have provided some more details : Ovipositing females live for 6-10 months ; a single female lays 45-285 eggs ; the incubation period of eggs is 3-5 days, the larval period 2-10 weeks, and the prepupal and pupal periods 1-4 weeks ; the total life-cycle takes 27-315 days.

2. *Tribolium castaneum* (Herbst)

(The Red Flour Beetle)

(Text-fig. 2)

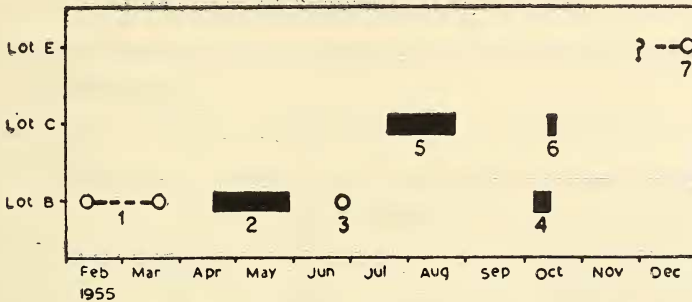
Emergences of beetles from the five lots of dum nuts (*vide supra*) is discussed below. Emergence occurs from tiny, round holes, *c.* 1 mm. or less in diameter, on the surface of the nut.

## Lot A

No *Tribolium* emerged though some 5347 *Coccotrypes* came out.

## Lot B

The monthly distribution of the 62 beetles which emerged during 1955, was as follows:—February and March, 3 *en route* (4·8%); April, 10 (16·2%); May, 18 (29%); June, 26 (41·9%); July, 1 (1·6%); August and September, 0; and October, 4 (6·5%).



TEXT-FIG. 2. *Tribolium castaneum*. Diagram showing emergence periods of beetles from dum nuts, *Hyphaene thebaica*, at Dehra Dun. Main or heavy emergences (Nos. 2, 4, 5 and 6) are shown in thick solid rectangles; and odd emergences (Nos. 3 and 7) in small circles. Emergence at Nos. 1 and 7 occurred *en route*. (See Table 2 for fuller details.)

When grouped into active and inactive periods, the following trend is seen:—After the scanty emergence *en route* from Coimbatore (3 beetles) during the period 12 February to 17 March, there was no emergence for 32 days (18 March to 18 April). Then there was a spurt of emergence (54 beetles or 87·1%) for 67 days, from 19 April to 24 June, followed by a long lull of nearly 30 months (25 June to 5 October) during which there was no emergence except for an odd beetle on 23 July. A weak emergence (4 beetles or 6·5%) occurred on 6 October after which there was no emergence, and nuts and pieces examined on 18 May 1956 showed no insects except 2 odd larvae.

## Lot C

The monthly distribution of the 47 beetles which emerged during 1955-56 was as follows:—July, 2 (4·3%); August, 2 (4·3%); September,

0 ; October, 28 (59.6%) ; November-February next, 0 ; and March, 15 (31.9%).

When grouped into active and inactive periods, the following trend is seen :—After scanty emergence (4 beetles or 8.5%) for a little over a month (8 July to 8 August) there was complete lull for some 2 months (10 August to 4 October). This was followed by a spurt of emergence (28 beetles or 59.6%) on October 5 and 6, followed again by a long lull of nearly 5 months (7 October 1955 to 6 March 1956). Then there was another spurt of emergence (15 beetles or 31.9%) on 7 March 1956, after which emergence ceased. The nuts, when examined on 18 May, showed no more insects.

#### Lot D

No *Tribolium* emerged though some 89 *Coccotrypes* came out.

TABLE 2

EMERGENCE OF BEETLES OF *Tribolium castaneum* FROM DUM NUTS, *Hyphaene thebaica*, AT DEHRA DUN DURING 1955-56, GROUPED INTO ACTIVE AND INACTIVE PERIODS

Period 1955-56	No. of days	Beetles emerged	
		Number	% of total emergence
Lot B (1955)			
(1) 12 Feb.-17 March	.. 34	3	4.8
(2) 18 Mar.-18 Apr.	.. 32	0	0
(3) 19 Apr.-24 June	.. 67	54	87.1
(4) 25 June-22 July	.. 28	0	0
(5) 23 July	.. 1	1	1.6
(6) 24 July-5 Oct.	.. 74	0	0
(7) 6 Oct.	.. 1	4	6.5
No further emergence up to 18 May 1956.			
Total ..	237	62	—
Lot C (1955-56)			
(1) 8 July	.. 1	1	2.1
(2) 9-25 July	.. 17	0	0
(3) 26 July	.. 1	1	2.1
(4) 27 July - 8 Aug.	.. 13	0	0
(5) 9 Aug.	.. 1	2	4.3
(6) 10 Aug. - 4 Oct.	.. 56	0	0
(7) 5-6 Oct.	.. 2	28	59.6
(8) 7 Oct. -6 Mar.	.. 151	0	0
(9) 7 Mar.	.. 1	15	31.9
No further emergence up to 18 May 1956.			
Total ..	243	47	—

*Lot E*

One beetle emerged *en route* from Coimbatore up to 28 December 1955. No further emergences occurred though the material was kept under observation until 18 May 1956.

*Conclusions*

There would appear to be three principal periods of emergence at Dehra Dun, as follows :—(i) Early March (c. March 7) ; (ii) the third week April to last week June (c. 19 April to 24 June) ; and (iii) the first week October (5-6 October). Besides these, weak emergences of odd beetles occurred during July and August. Some emergence occurred *en route* from Coimbatore during 12 February to 17 March and in December.

The beetle is widely distributed the world over in flour, and also occurs abundantly throughout India and the East in timber, wooden articles, bamboos, seeds, dried fruit and cereals. According to Kushwaha and Sharma (1968), the life-cycle takes about 6 weeks in August-September, and may be prolonged in winter ; a female lays c. 400-500 eggs ; the incubation period is 5-12 days, the larval period 4 weeks and the pupal period 6-9 days.

## SUMMARY

1. The dum nut, *Hyphaene thebaica* Mart., is imported into India from the Sudan, Africa, for manufacturing buttons and beads. The nuts are frequently infested with three species of beetles, viz., *Coccotrypes dactyliperda* (F.) (Scolytidae), *Oryzaeophilus surinamensis* (L.) (Cucujidae) and *Tribolium castaneum* (Herbst) (Tenebrionidae). The heaviest infestation is by *Coccotrypes*, that by the other two being much milder.

2. Hitherto, no information was available about the periods of emergence of these beetles from dum nuts. Observations on the last two species are given here. The infected nuts were obtained from Coimbatore (southern India) which is a manufacturing centre, and emergences observed in cages in unconditioned rooms at Dehra Dun where the summer (April to mid-June) is mild, the rains (mid-June to September) heavy and the winter (November to February) severe.

3. Five lots of infected nuts, consisting of 55 whole nuts, 142 pieces and 118 buttons, were caged at various intervals. The emergence periods of the beetles at Dehra Dun were as follows :—

(a) *Oryzaeophilus surinamensis*—There were two main periods of emergence, viz., one in April-May (19 April—27 May) and the other in July-August (18 July—24 August). A third period of relatively weak emergence occurred in the first half of October (6-13 October). Some emergence *en route* from Coimbatore occurred during 12 February—17 March and in December, and an odd emergence occurred on 24 June.

(b) *Tribolium castaneum*—Three principal periods of emergence occurred, viz : (i) Early March (c. March 7) ; (ii) the third week April to last week June (c. 19 April—24 June) ; and (iii) the first week October (c. 5-6 October). In addition, weak emergences of odd specimens occurred during July and August. Some emergence *en route* from Coimbatore occurred during 12 February-17 March, and December.

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